

Missouri Resources

Winter 2017 • Volume 34 • Number 1



director's comment

It's great to be back with the Department of Natural Resources and serving as the director. Protecting and enhancing Missouri's natural and cultural resources continues to be a key focus in my 23-year career with the State of Missouri.

As an environment and agriculture attorney, I have served as deputy chief of staff to Gov. Nixon, acting director and later deputy director for the Department of Agriculture. In addition, I previously served as the general counsel for the Department of Natural Resources. In 2012, I helped lead the Drought Assistance Program through the Soil and Water Conservation Program, which provided vital relief to Missouri's livestock and crop production industry. I also spent 16 years working as an assistant attorney general in the Agriculture and Environment Division for the Attorney General's Office.

When not working to improve Missouri's natural resources by day, you can find me operating and managing a 536-acre row crop and hay farm in Monroe County, as well as an 80-acre farm in Chariton County. Both my career and time spent working on the farms reaffirm my belief that the overall health of Missouri's soil and water quality plays a critical role in the quality of life for all Missourians.



In fact, 80.1 percent of Missouri voters agreed that it is vitally important to manage our state parks and historic sites and conserve our soil and water resources when they renewed the Parks, Soils and Water Sales Tax for the next 10 years. The sales tax has been renewed four times; however, this was the first time it was approved by voters in all 114 counties. In 2006, the sales tax was approved in all but three counties.

Other states envy Missouri for its dedicated tax and support to promote good farming techniques that help keep soil on the fields, our waters clean and provide a state park system that is consistently ranked among the top four park systems in the country.

Learn more about the sales tax in this issue of Missouri Resources by reading *Missourians Voted to Keep a Good Thing Going* on page 25.

I look forward to the great strides that Missouri will continue to make to enhance our natural resources, thanks to your support and commitment.

Harry D. Bozoian
Missouri Department of Natural Resources

Missouri Resources

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Mission Statement

The mission of the Missouri Department of Natural Resources is to protect our air, land and water; to preserve our unique natural and historic places; and to provide recreational and learning opportunities for everyone.

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2 Wild Times at Big Sugar Creek State Park

by Tom Uhlenbrock

The new Elk River Hills Wild Area within Big Sugar Creek State Park in McDonald County may be as wild as they come, but you couldn't tell by listening. Even the sudden buzz of a lone cicada in the early fall may jolt you right out of your hiking boots.

8 Partnering for Missouri's Prairies

by John Nichols

Before the lead and zinc mining era had begun more than 150 years ago, vast expanses of southwest Missouri were still predominately prairie lands. Today, native grasslands and tallgrass prairie are on the rebound – thanks to a successful restoration partnership.

12 2016 MissouriDNR Photo Contest

by Renee Bungart

The Missouri Department of Natural Resources' third annual photo contest once again showcases the pictures that best illustrate our Missouri – the natural wonder we all appreciate, and never take for granted.

departments

18 Explore Missouri 20 DNR News 22 Top Spots 25 ... But Not Least

Above: Massive, rotating ice discs pass approximately 70 feet below the deck of the east Missouri River Bridge in Jefferson City. Photographed in December 2015, the image has been rotated clockwise to show the southern riverbank at the bottom of the frame.

Front cover: Interpreter Kristi Henry talks with guests at the Christmas candlelight tours at Hunter-Dawson House State Historic Site in New Madrid. *MoDNR photos by Ben Nickelson.*

Back cover: A family celebrates their catch on trout opening day 2016 at Montauk State Park. *MoDNR photo by Andrew Richmond.*



Wild Times at Big Sugar Creek State Park

by Tom Uhlenbrock

You can hear wilderness.

Kerry Hays is natural resource manager of two state parks located within an hour's drive of each other in the far southwest corner of Missouri.

Roaring River State Park is one of the state park system's three popular trout-fishing parks and offers fishing, camping, swimming and hiking. With a lodge, swimming pool, store and nature center, the state park can be a busy place on weekends.

Big Sugar Creek State Park has a parking lot, and a trail that follows creek bottoms around and up a forested ridge and back down.

On a drive west from Roaring River to Big Sugar Creek, Hays predicted that our arrival would be met with the sound of silence, except for nature's noisemakers.

"See what I mean?" he said as we exited our van to a starkly quiet natural landscape.

We heard no evidence of civilization, no drone of a distant interstate. After several minutes, a cicada broke the silence with a buzz that sounded like a roar.

"Nature can be very loud," Hays said.

Bill Bryan, director of Missouri State Parks, called Big Sugar "a gem in the crown of state parks for its biological diversity and pristine landscape."

Bryan announced this summer that 1,168 acres of the park had been designated the Elk River Hills Wild Area, the first wild area designated in the state since 1995 when Goggins Mountain Wild Area was established at Johnson's Shut-Ins State Park.

A wild area is preserved forever for the plants and animals that live there, and the hikers and backpackers who visit them. Twelve areas totaling nearly 25,000 acres in 10 state parks have been designated wild areas. The nomination for the new wild area designation



MoDNR photo by Ben Nickelson

said: "The backcountry hiking opportunity provided by the Elk River Hills Wild Area will offer park visitors a unique opportunity for solitude in a wilderness setting, free from noise and light pollution and signs of man-made development."

A Pristine Natural Area

Hays explained why the two radically different parks both play an important role in Missouri State Parks.

"Our mission is to provide recreational opportunities for people, but also the chance to be in a natural area and appreciate it," Hays said. "Our focus is going to be to keep Big Sugar Creek as a pristine natural area."

Located on the back roads of McDonald

County near Pineville, Big Sugar Creek State Park is best explored in spring, when the woodland wildflowers are blooming, and fall, when the trees glow with autumn colors.

"And you can see so much more in the winter without the leaves," said Ryan Persinger, an interpretive resource specialist who joined us on the trip.

The trail followed a creek bed piled with huge slabs of white limestone up a gentle incline to the top of the ridge, a gain in elevation of about 350 feet. The wild area is called Elk River Hills because the valleys drain into Big Sugar Creek, a tributary of the Elk River.

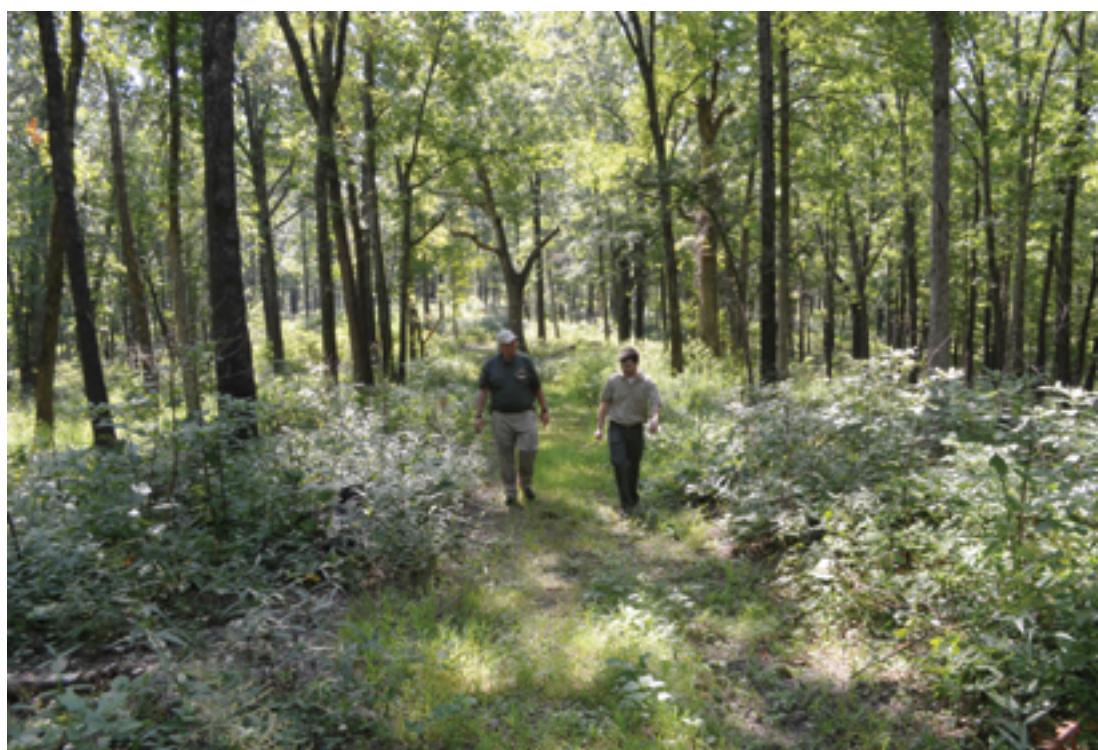
The trail is named after the Ozark chinquapin, a relative of the American chestnut

(Opposite page) A puddle of water remains in the rocky creek bed along Ozark Chinquapin Trail at Big Sugar Creek State Park in McDonald County.

MoDNR photo by Ben Nickelson

(Top) Late summer wildflowers blossom beside a tributary that flows into Big Sugar Creek.

(Bottom) Natural Resource Manager Kerry Hays and Interpretive Resource Specialist Ryan Persinger walk the Ozark Chinquapin Trail.



MoDNR photo by Tom Uhlenbrock



“A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and community of life are untrammeled by man, where man himself is a visitor who does not remain.”

- Wilderness Act of Sept. 3, 1964



(Top) The Ozark Chinquapin Trail climbs into pristine upland woodlands and glades.

(Above) The trail follows a small bedrock stream, surrounded with steep hills.

that suffers from an exotic fungal disease known as chestnut blight. The namesake tree can be found along Ozark Chinquapin Trail, but they are obviously stunted compared to the mature oaks that dominate the forest canopy. On the way back down the ridge, Hays

abruptly stopped dead in his tracks upon detecting a foreign sound.

“Hear that?” he asked.

We listened intently, and eventually determined that a small propeller plane was flying somewhere up in the clouds.

Not Many Places Left

To qualify as a state wild area, a tract must be spacious, generally 1,000 acres in size, and be largely “untrammeled by man.” That quote comes from the Wilderness Act, passed by Congress more than 50 years ago.

“A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and community of life are untrammeled by man, where man himself is a visitor who does not remain.”

Inspired by the federal action, Missouri State Parks began assessing its inventory of land to find pristine tracts and in 1978 set up a program to designate them as “wild areas.”

“Wilderness is a place undeveloped, large in size,” said Ken McCarty, chief, Natural Resources Management Section of Missouri State Parks. “There aren’t many places left where you can actually have that.”

To mark the 50th anniversary of the federal Wilderness Act, Missouri State Parks looked for an addition to its wild areas, and the tract at Big Sugar Creek State Park was a logical choice, McCarty said.

“It’s very wild, very natural in appearance,” he said. “The attributes our team was looking for include wild and rugged, no traffic noise, no light pollution, captivating scenery with multiple scenic locations, high diversity. That’s the essence of wilderness.”

Wild areas are kept that way with special regulations – no roads, no bicycles, no buildings, no vehicles of any kind and no mechanized or motorized equipment. “That applies to the public as well as staff,” McCarty said.

Prescribed fire, which mimics those that occurred naturally, is used as a management tool at Big Sugar Creek State Park. Prescribed burns help maintain or establish the open character of the woods with grasses and wildflowers in the understory.

“Preserving the wildness is the most essential attribute,” McCarty said. “It might very well resemble what the land was like 50 years ago, or 500 years ago, with only the forces of nature affecting it. The forests will stay that way forever.”

See details on Elk River Hills Wild Area, and Missouri’s 11 other state park wild areas on the next two pages. For more information, visit mostateparks.com. 

Tom Uhlenbrock is a writer for Missouri State Parks, a division of the Missouri Department of Natural Resources.



MoDNR photo by Ben Nickelson

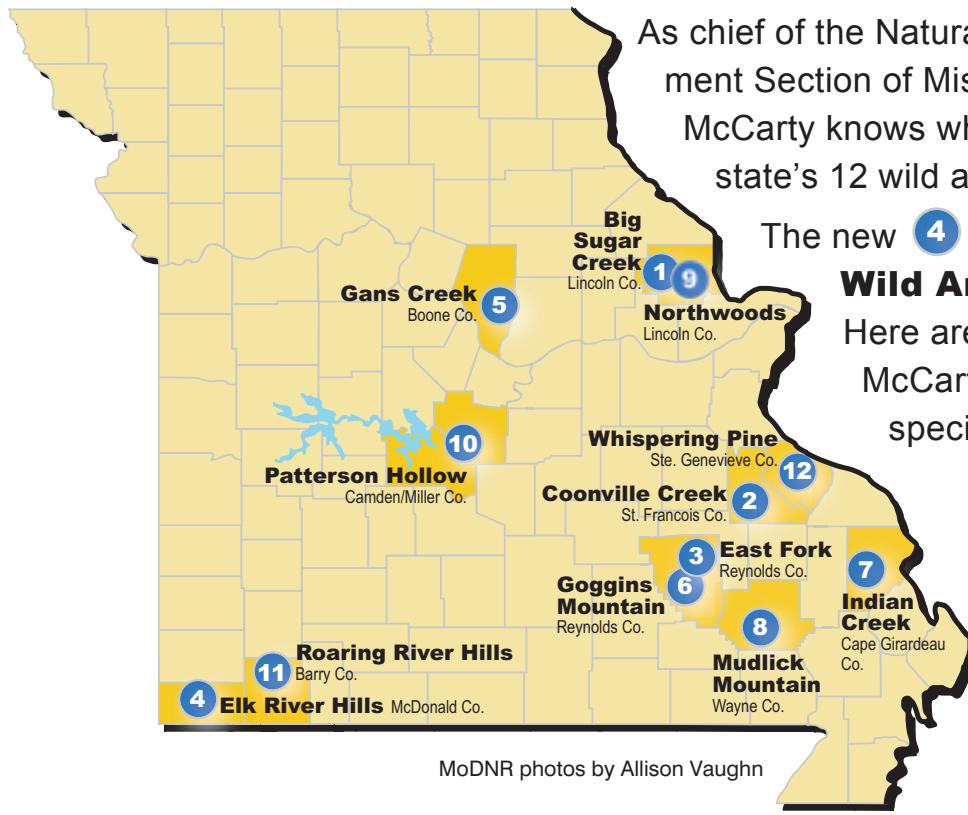


MoDNR photo by Allison Vaughn

(Top) The Elk River Hills Wild Area offers abundant opportunities to see local native plants, such as this great blue lobelia.

(Above) Along the trail, visitors can enjoy grand views of the rugged Elk River landscape.

Missouri Wild Areas



MoDNR photos by Allison Vaughn

As chief of the Natural Resources Management Section of Missouri State Parks, Ken McCarty knows what makes each of the state's 12 wild areas special.

The new ④ Elk River Hills Wild Area joins rare company.

Here are the 11 others, with McCarty's comments on their special attributes.



Ken McCarty

① Big Sugar Creek at Cuivre River State Park

State Park: "Big Sugar Creek is distinguished by open forest woodlands of white oak with a series of hills and hollows."

② Coonville Creek at St. Francois State Park

State Park: "It includes a very clear, bedrock-lined creek fed by springs and fens, and low forested hills dominated by white oaks and post oaks with some glade outcrops."

③ East Fork at Johnson's Shut-Ins State Park:

"This is the St. Francois Mountains, dominated by their volcanic origin, with wet-weather streams and waterfalls."



⑤ Gans Creek at Rock Bridge Memorial State Park

Memorial State Park: "This is our smallest wild area in our most urban population center. It has an outstanding collection of native forest, with steep hillsides and bluffs overlooking Gans Creek."

⑥ Goggins Mountain at Johnson's Shut-Ins State Park:

"Again, we're in a very rugged section of the St. Francois Mountains that adjoins Bell Mountain, operated by the national forest service to make one of our largest wilderness areas."



⑦ Indian Creek at Trail of Tears State Park

Park: "This is a very deeply cut section of river hills with high narrow ridge tops overlooking the Mississippi River."

⑧ Mudlick Mountain at Sam A. Baker State Park:

"A 900-foot-tall mountain leads down into Mudlick Hollow, a very scenic igneous gorge with water cascading through narrow canyons into Big Creek."



Name of Area / State Park	Total Acres	Designation Date
Big Sugar Creek Cuivre River State Park	1,675	9/10/1981
Coonville Creek St. Francois State Park	2,258	1,700 acres - 7/8/1978 165 acres - 4/2/1980 271 acres - 11/17/1982 120 acres - 5/6/1985
East Fork Johnson's Shut-Ins State Park	1,168	1,050 acres - 3/29/1979 60 acres - 2/8/1985
Elk River Hills Big Sugar Creek State Park	1,168	5/13/2016
Gans Creek Rock Bridge Memorial State Park	720	5/24/1978
Goggins Mountain Johnson's Shut-Ins State Park	5,000	3/31/1995
Indian Creek Trail of Tears State Park	1,300	5/24/1978
Mudlick Mountain Sam A. Baker State Park	4,420	4,180 acres - 1/28/1981 240 acres - 9/22/1983
Northwoods Cuivre River State Park	1,082	830 acres - 7/6/1978 252 acres - 4/2/1980
Patterson Hollow Lake of the Ozarks State Park	1,275	1,200 acres - 5/24/1978 75 acres - 1/3/1983
Roaring River Hills Roaring River State Park	2,075	5/24/1978
Whispering Pine Hawn State Park	2,080	1,770 acres - 8/16/1979 310 acres - 2/8/1985



9

Northwoods at Cuivre River State Park: "This is a classic northern Missouri oak-hickory forest with hollows that go into Big Sugar Creek."



11

Roaring River Hills at Roaring River State Park: "Glades are one of the interesting features of this rugged landscape with meadows and grasslands intermixed across the forest."

10

Patterson Hollow at Lake of the Ozarks State Park:

"A tract of very thick oak-hickory forest, a lot of it regrown from historic fields and reclaimed by nature."



12

Whispering Pine at Hawn State Park:

"The pines, sandstone hills and hollows and clear, sand bottom creeks make this what many consider our prettiest park and a popular hiking destination."

Partnering for Missouri's Prairies

by John Nichols

When valuable lead and zinc deposits were discovered in southwest Missouri more than 150 years ago, much of the area was still dominated by rolling grasslands. Large expanses of native tallgrass prairie blended with open savannas and pockets of woodlands growing along the larger creeks and rivers.

Once lead was discovered and more people moved to the area, settlers began plowing up the prairies for pasture and cropland, as well as mining for the precious metal. Mine waste piled up around small mines all across the region, leaching lead and other metals into the soils and streams.

Although the last of these mines closed more than 60 years ago, the effects the development and contamination have had on the local ecosystem persist. Today, a new initiative between the Missouri Department of Natural Resources (MoDNR), the United States Fish and Wildlife Service (USFWS) and Webb City is aiming to undo some of the damage caused by the mining and reconstruct a portion of Missouri's native prairie legacy.

The Tri-State Mining District, which includes portions of Missouri, Kansas and Oklahoma, was an important lead and zinc producing area between the 1850s and 1950s. Mining influenced the entire region; many of the towns and cities there today began as small mining camps clustered around the mills, smelters and the more productive mines.

Those were the "pre-law" days, before environmental regulations promoted responsible mining, and held owners and operators responsible for cleaning up the contamination left behind. When the ores ran out, the miners simply moved on, leaving open mine shafts, and vast piles of waste chat towering over the landscape.

"There have been thousands of acres of land in and around Webb City that sat vacant and unusable since the mines were shut down," said Carl Francis, Webb City Administrator.

In Jasper County alone, more than 150 million tons of mine waste lay scattered about, contaminating more than 10,000 acres of land and water. These ore processing wastes contain high concentrations of potentially harmful metals like lead, zinc and cadmium. As a result, Jasper County was placed on the National Priorities List of Superfund sites in 1990. To date, remediation work conducted by the department, the U.S. Environmental Protection Agency and several of the mining companies has addressed more than 2,600 residential yards



and in excess of 3,500 acres of mine waste.

Although the Superfund cleanup has significantly reduced human exposure to the contamination, the effects on the wildlife and natural communities are ongoing. When the mine waste was extracted, much of the contaminated topsoil underneath also had to be removed. These extreme efforts left large tracts scraped down to the underlying clay and rock. Residual levels of metals, while deemed acceptable for human health, can be toxic to the plants and animals that spend their lives rooting, burrowing or feeding in the soils and small streams.

MoDNR photo by John Nichols



MoDNR photo by John Nichols



MoDNR photo by Ben Nickelson



"Without restoring the soils, the affected landscape will remain barren except for the most tolerant of weeds," said USFWS biologist Scott Hamilton.

At many sites, these types of natural resource injuries to wildlife and natural communities are addressed through the Natural Resource Damage Assessment and Restoration process, under the Comprehen-

sive Environmental Response, Compensation and Liability Act (CERCLA) – better known as Superfund. The department and the USFWS act as trustees for Missouri's natural resources, with a mission to restore, replace, or acquire the equivalent of those natural resources that were injured by the contamination.

When the American Smelting and Refining Company (ASARCO), which operated many mines in The Tri-State mining district, filed for bankruptcy, the trustees had an opportunity to

(Top) Chat piles, like this one near Carterville, once covered thousands of acres in Jasper and Newton counties. Only a few remain today.

(Middle) Prescribed burns are being used to clear the ground for native plantings and promote native prairie vegetation in the restoration areas.

(Bottom) As native prairie vegetation reclaims the land, only stone foundations, like this lead furnace, remain as relics of Webb City's mining history.

(Below) John Nichols inspects a native grass grown in an area where compost was used to improve the degraded soil.
(Bottom) On the right of the photo is a dense stand of native forbs and warm-season grasses grown in soil treated with compost. It stands in stark contrast to the rocky, untreated soil left after the mine waste is removed, seen on the left side of the frame.

recover natural resource damages. The Missouri Trustee Council received a settlement of \$21 million to use for natural resource and habitat restoration projects in the affected area.

"The core philosophy encompassing natural resource damages is that a state's public lands, waters and living resources are held in "trust" for the benefit of the citizens of the state," said Leanne Tippett Mosby, the department's Division of Environmental Quality director. "Citizens have the right to use and enjoy natural resources and as a natural resource trustee, the department has the duty and responsibility to protect these resources."

will be able to access trails winding through rolling prairies, woodlands, riparian wetlands, and over 4 miles of stream corridor.

The complete habitat restoration phase of the project is expected to take between 3 to 5 years, depending on conditions. Various restoration work is being incrementally introduced. Some prairie areas will be complete around 2018 while others requiring more extensive preparations are more likely to be finished in 2020. Construction of the network of trails will follow as conditions allow, once the habitat restoration is in place and sustaining itself.

"The area to be restored is relatively barren, without much of any cover," says Webb City's new habitat manager, Randy Haas. "After the restoration is complete and has had some time to establish, much of this land will offer cover and food sources for many species of mammals, birds and insects."

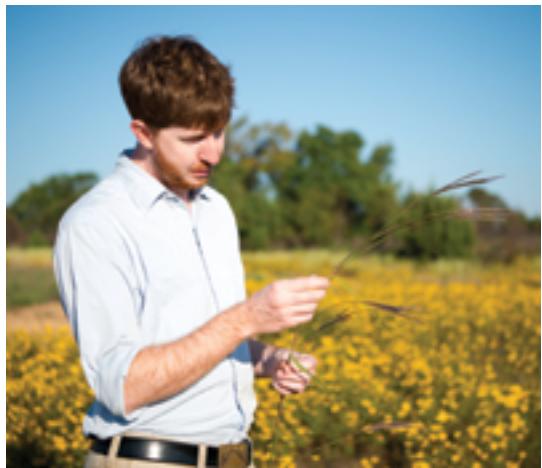
In order to rebuild the topsoil in these highly degraded areas, they are going to be using compost – lots of compost. Project managers estimate they will need between 60,000 and 80,000 tons of compost to spread a 4- to 6-inch layer of the rich organic material over approximately 450 acres of degraded land. That's about enough compost to cover a football field 30 feet high.

To produce that much compost, the trustees have been experimenting with combinations of various organic waste available in the region. Sources for making the compost include cattle manure from a local stockyard, wood chips from the city's limb yard, sawdust from a nearby sawmill, and sludge from the city's wastewater treatment plant. This helps solve two problems: eliminating costly waste streams, and producing a material to help rebuild the degraded soils.

"We're turning to multiple waste sources that can pollute streams if stockpiled carelessly, into a product that can restore the land," said Hamilton.

The compost also helps neutralize the heavy metals that are still in the soil. Phosphorus in the compost reacts with lead and other

MoDNR photo by Ben Nickelson



MoDNR photo by Ben Nickelson

“ ... Our legacy of 15 million acres of original prairie has been reduced to an estimated 70,000 scattered acres.”

- Carol Davit, executive director, Missouri Prairie Foundation

metals to create compounds that are not toxic to plants or animals.

Once ready, the compost will be spread over the most degraded areas. Later, a seed mix containing at least 15 species of native grasses and wild-flowers will be applied to the fields. Over the next few years, invasive species will be treated and additional seed spread. Prescribed fire will be introduced to mimic the pre-settlement disturbance regime that helps control the invasive species and promote the regeneration of the native plants.

The restoration area also includes more than 130 acres of floodplain along Center Creek. Wetlands will be restored and a newly established wetland will receive effluent from the municipal wastewater treatment plant to help remove some of the excess zinc before it flows into the creek. The new wetland potentially could save the community money by preventing costly treatment upgrades. It also will offer exceptional opportunities for viewing migratory waterfowl.

The department is helping fund the purchase of native prairie remnants in Jasper and Newton counties by partnering with the Missouri Prairie Foundation (MPF). These areas, which have never been plowed, are an extremely rare ecosystem.

“Historically, Missouri was very much a prairie state,” said Carol Davit, executive director of the MPF. “Our legacy of 15 million acres of original prairie has been reduced to an estimated 70,000 scattered acres.”

Carver Prairie, just south of Webb City in Newton County, is the first property purchased with this funding. It was dedicated at a special event in July, 2016.

Another benefit from the Webb City project, according to City Administrator Francis, is the sense of cooperation from all involved.

MoDNR photo by Ben Nickelson



“Agencies from the federal, state and local levels have recognized a problem and worked together to develop a cost-effective solution,” Francis said.

As the mine waste cleanup continues in southwest Missouri, MoDNR and its partner agencies will continue to restore the lands, streams and natural communities, making Missouri’s natural resources healthier for plants, animals and people alike. 

John Nichols is an environmental specialist for MoDNR’s Hazardous Waste Program. He is involved with the Webb City mining cleanup and prairie restoration project.

(Top) A patchwork of constructed and natural wetlands will be restored along the Center Creek floodplain in Webb City.
(Bottom) Staff from MoDNR, the Missouri Prairie Foundation and the National Park Service celebrate the dedication of the 160-acre Carver Prairie in Newton County. Native prairie remnants are being protected to replace those lost due to mining.



Russell Kinerion, Missouri Prairie Foundation

The Beauty of Nature MissouriDNR Photo Contest

by Renee Bungart

Deputy Communications Director

Can you imagine living in a world without nature? No trees, no wildlife, no cool spring waters to dip our toes into nor the opportunity to experience Mother Nature's four seasons? Thankfully, Missourians are able to enjoy all of this and more!

The photographers who entered the 391 photos in the Missouri Department of Natural Resources' third annual MissouriDNR Photo Contest certainly captured the essence of Missouri in all its glory. From watching fox kits play

along the Mississippi River to snow-flakes falling on Bollinger Mill State Historic Site, it's easy to find the beauty in nature.

"Those who contemplate the beauty of the earth find reserves of strength that will endure as long as life lasts. There is something infinitely healing in the repeated refrains of nature – the assurance that dawn comes after night, and spring after winter."

-Rachel Carson,
author, *Silent Spring*

The department asked amateur photographers to capture the wonders of Missouri and selected first, second, third places as well as honorable mention in three categories – Natural Resources, Unique Places, and People Enjoying Missouri's Waterways. Congratulations to the winning photographers and all of those who participated in the contest. See the top 10 photos from each category and learn about the 2017 contest by visiting dnr.mo.gov/photocontest. 

Natural Resources



FIRST PLACE Wendy Ololeo, St. Charles *Fox Kits at Play* Mississippi River near Lock & Dam 25

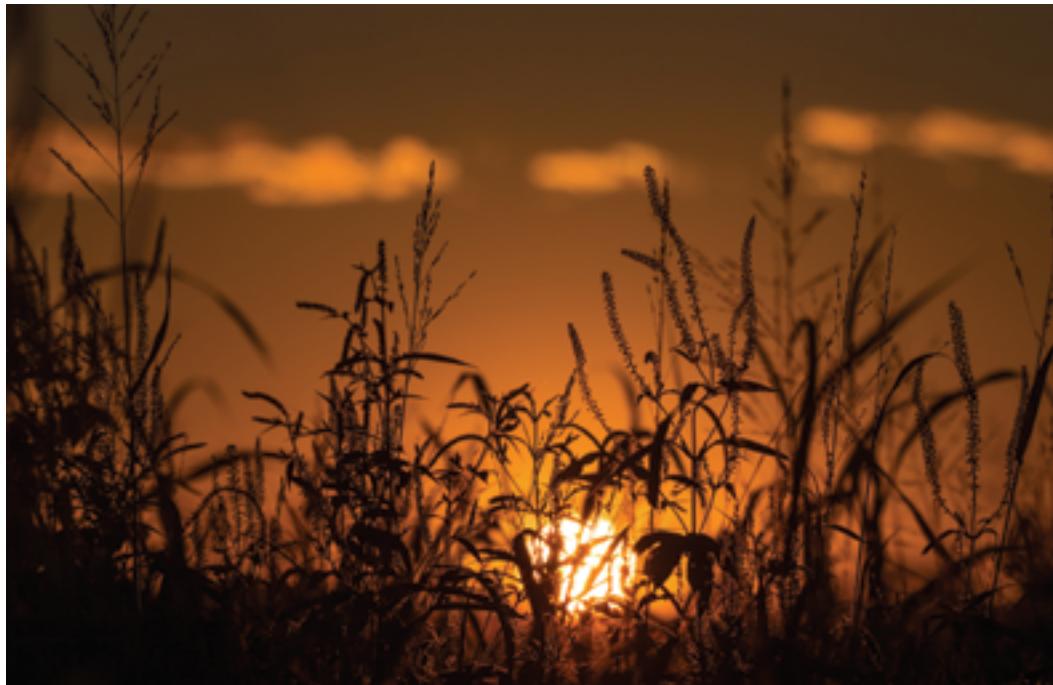
SECOND PLACE

**Madison Hoover,
Jefferson City**
Peeping Peeper
Cole Co.



THIRD PLACE

**Emily Moore,
St. Louis**
Field on Fire
Riverlands Migratory Bird
Sanctuary, West Alton



HONORABLE MENTION

Caleb Swallows, Puxico
The Thief
Mingo National Wildlife Refuge, Puxico



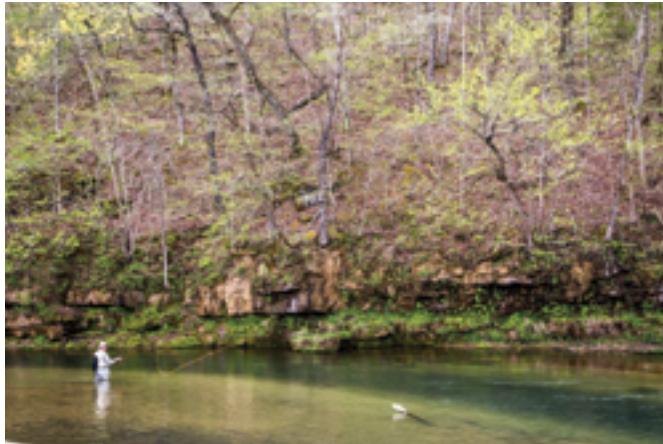
People Enjoying Missouri's Waterways



FIRST PLACE

**Joseph Hernandez,
Kansas City**

*Fishing at Lake Tapawingo
Jackson Co.*



HONORABLE MENTION

Eric Nichols, O'Fallon

*Fly Fishing the Current
Current River, Dent Co.*



SECOND PLACE

**Brooke Reynolds,
Moberly** Goldendoodle Cove
Long Branch State Park,
Macon Co.



THIRD PLACE

Jonathan Douglass, Sikeston

Enjoying the Shut-Ins

Johnson's Shut-Ins State Park, Reynolds Co.

Unique Places



FIRST PLACE **Steve Jett, St. Charles** *Above the Ruins* Ha Ha Tonka State Park, Camden Co.

HONORABLE MENTION

Nancy Kossman, Union

Lily Pad Pool

Onondaga Cave State Park, Crawford Co.





SECOND PLACE Joyce Sheldon, House Springs

Blazing Stars at Taum Sauk Mountain Taum Sauk Mountain State Park, Iron/Reynolds Co.



THIRD PLACE Dave Willingham, Jackson

Bollinger Mill in Winter
Bollinger Mill
State Historic Site,
Cape Girardeau Co.

Don Robinson State Park

New State Park Opening Near St. Louis

by Tom Uhlenbrock



Don Robinson's gift to the people of Missouri comes as something of a special Christmas present.

Missouri State Parks will officially open Don Robinson State Park this winter. The park is southeast of Pacific in northwest Jefferson County, about 30 minutes from the St. Louis metropolitan area.

Robinson died in March 2012 at the age of 84, four years after he put his land in a trust to become part of the state park system upon his death.

The state was eager to accept Robinson's donation because of its unique landscape and location just minutes from Interstate 44 and suburbia.

The land totals 818 acres and is located in the upper watershed of LaBarque Creek, a high-quality stream supporting more than 40 different species of fish.

The property features sandstone box canyons, shelter caves, cliffs, glades, upland and bottomland forests and almost 650 species of plants. Migratory

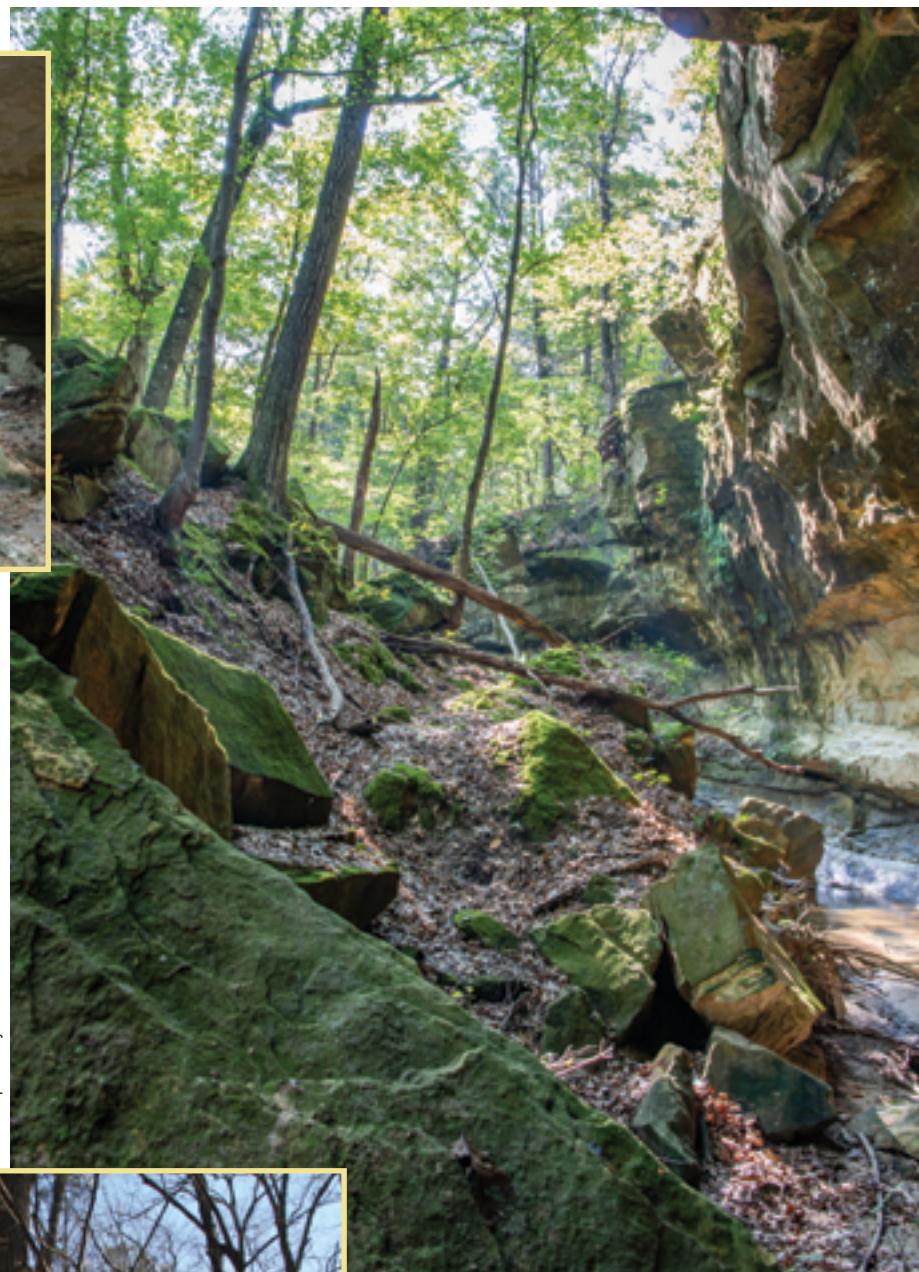
songbirds are found in the forests, which include stands of native shortleaf pine.

Missouri State Parks has created a system of trails to show off the diversity of the property.

Robinson was a St. Louis businessman who produced a spot remover called "Off," and marketed it on late-night TV. A lifelong bachelor, he lived alone in a rock house located at the pinnacle of the property with a widow's walk that provided a 360-degree

The late Don Robinson, in front of the home he built in Jefferson County and donated to the Missouri state park system. Robinson's gift led to the creation of a new state park that boasts unrivaled biologic and geologic diversity. MoDNR photo by Tom Uhlenbrock

MoDNR photo by Ben Nickelson



MoDNR photo by Ben Nickelson

Happy Holidays to the state's hikers and nature lovers. Don Robinson State Park is slated to open this winter. Visit mostateparks.com for updates.

Tom Uhlenbrock is a writer for Missouri State Parks, a division of the Missouri Department of Natural Resources.



MoDNR photo by Tom Uhlenbrock

(Top left) Sandstone Canyon Trail allows hikers to explore the eastern half of Don Robinson State Park and its many natural wonders, from lush mesic bottoms to dry uplands.

(Above) A view from within a sandstone canyon, a unique feature of the LaBarque Creek Watershed.

(Left) Seeps in the walls of sandstone box canyons freeze into ice formations during the winter.

Gov. Nixon Opens Centennial Bluff Trail

In October, Gov. Jay Nixon joined the public in celebrating the opening of Centennial Bluff Trail at Current River State Park. The 1.4-mile trail was designed in celebration of the park system's 100th anniversary.

The rugged terrain of the Centennial Bluff Trail invites hikers to enjoy a ridgeline setting with post oaks, black oaks and naturally occurring shortleaf pine trees that tower above a wide array of native flora. Along the trail, hikers can learn about the history of the Missouri state park system through a series of interpretive panels.

First Paddle MO Event for MoDNR and Stream Teams

In September 2016, the Missouri Department of Natural Resources part-

nerned with Stream Teams United to put on the first-ever Paddle MO. Paddlers put their boats in the waters of the Missouri River at Hermann and took out 100 miles and 5 days later at the confluence with the Mississippi River. The goal was to connect people to the river and the communities along its banks.

Employees from the department presented educational programs for the paddlers on Native Americans, water quality monitoring and more, at boat ramps and sand bars along the river. Local communities also were part of the event as participants stopped in towns along the river for fall festivals, meals and camping.

As paddlers learned about Missouri's natural and cultural resources, they also engaged in healthy outdoor activities and participated in the Governor's 100 Missouri Miles Challenge.

The department and Stream Teams United are two of the partners that support the Missouri Stream Team Program, which has been monitoring waterways for over 25 years. For more information about the Paddle MO event, go to bit.ly/2epEKVg.

Missourians for Monarchs Collaborative



The Missouri Department of Natural Resources is proud to be a member of the Missourians for Monarchs collaborative. The collaborative has successfully completed the first monarch and pollinator conservation plan to enhance and restore monarch butterfly and pollinator habitat on public and private lands in Missouri.

Time Exposures

In 1898, the original St. Louis Browns were in a tight spot. After a decade of dismal performance and declining profits, a fire destroyed New Sportsman's Park stadium, forcing them into bankruptcy. After being purchased by Frank De Haas Robinson, owner of the Cleveland Spiders, work began on turning the team around as they came off of a horrific 39-111 season. Robinson renamed the team the "Perfectos," provided uniforms with cardinal red trim and sock striping, and renamed their stadium League Park.

In addition, just weeks before the season opener, Robinson stacked the team's roster with marquee talent from the Cleveland Spiders. These future Hall of Famers included greats such as Bobby Wallace, Jesse Burkett and Cy Young.

The result was a team that would go on to play for an 84-67 season record in 1899 and a 5th place National League finish – their best record between the American Association era until 1921. Robinson's Cleveland Spiders lost 134 games that same year. This photo of the 1899 Perfectos team is captioned "Group B, St. Louis Base Ball Club."

After St. Louis Republic sportswriter Willie McHale wrote of a female fan being pleased with the "lovely shade of cardinal" in their uniforms, fans quickly adopted the "Cardinals" moniker. The next year they officially became the Cardinals.

Sources: stlouis.cardinals.mlb.com/stl/history/timeline.jsp; baseball-almanac.com/teams/cards.shtml; [wikipedia.org/wiki/History_of_the_St._Louis_Cardinals_\(1875-1919\)](https://en.wikipedia.org/wiki/History_of_the_St._Louis_Cardinals_(1875-1919))

Send your photo to "Time Exposures," c/o Missouri Resources, PO Box 176, Jefferson City, MO 65102-0176. Original photos will be returned via insured mail. Pre-1980 environmental, historic/cultural and natural resource photos from Missouri will be considered. Please try to include the date and location of the picture, a brief description and any related historic details that may be of interest to our readers.



Library of Congress photo, Prints & Photographs Division,
Miscellaneous items in High Demand Collection [LC-DIG-ppmsca-1877]

The Missouri collaborative is the first in the nation to sign a memorandum of understanding between partnering organizations dedicated to increasing and sustaining habitat for monarch butterflies and pollinators through citizen involvement. It also seeks ways for partners to start similar efforts.

The success has been in large part due to the tremendous work put into ensuring input and partnerships from all sectors. This input can influence the strategies needed to ensure a successful Missouri effort. These partners include agriculture, business, not-for-profit, education, land management organizations, state and federal agencies, landowners and volunteers.

To learn more about the Monarch Butterfly, visit dnr.mo.gov/education/monarchs.

New Radioactive Waste Shipment Database



Federal Facilities has a new web-based Low-Level Radioactive Waste (LLRW) shipment system and database.

The new system offers LLRW shippers and carriers a single-stop portal for tracking their shipments and payment information. The system automatically generates a shipment form after submission of the required data. In the event of an accident, the new LLRW shipment system enables the Department of Health and Senior Services and the department's Environmental Services Program to quickly pull shipment information directly from the database, greatly reducing the time spent searching files for specific shipment forms.

This effort is an example of the Missouri Department of Natural Resources' initiative that focuses on increasing efficiency and effectiveness.

New Geologic Maps Now Available

The department's Geological Survey Program completed its most

OUR MISSOURI WATERS

Here's to Cover Crops

Watershed's plan reduces erosion and conserves water

In some watersheds in Missouri, the stormwater that runs off our fields and parking lots may later be the same water that flows back out of our tap as treated drinking water.

The North Fork Salt River Watershed in northeast Missouri is over one-half million acres in size and drains to the intake of the Clarence Cannon Wholesale Water Commission's drinking water treatment plant.

Their plant treats this raw water and then sends drinking water to its member systems in 14 counties that serve more than 70,000 people.

In 2016, the Clarence Cannon Wholesale Water Commission was awarded the Source Water Protection System of the Year award by the Missouri Rural Water Association. The commission has completed a Source Water Protection Plan for their watershed and received a grant from the Missouri Department of Natural Resources to fund educational fliers, a mobile watershed education trailer, funding for local farmers to plant cover crops, and a traveling educator who teaches about watershed environmental considerations. Project partners also included the Department of Conservation, the University of Missouri and local soil and water conservation districts.



Cover crops, such as radishes (above), improve watershed conditions by promoting infiltration of water and reducing soil erosion.

MoDNR photo by Mary Culler



recent National Cooperative Geologic Mapping Program STATEMAP mapping project. The bedrock mapping includes portions of Cole, Cooper, Howard and Moniteau counties.

Bedrock mapping was completed for seven 7.5-minute quadrangles at a 1:24,000 scale. The newly published maps include the Billingsville, Boonville, Bunceton, Lone Elm, Pilot Grove North, Pilot Grove South and Prairie Home quadrangles.

Bedrock maps provide information about the distribution and structure of consolidated rock such as limestone, sandstone, coal and granite. This information includes the layering of bed-

rock units as well as faulting, folding or deformation that may be present.

If you would like to obtain a copy of the new bedrock geologic maps or others, visit the Missouri Geology Store at 111 Fairgrounds Road in Rolla, order at missourigeologystore.com, or call 573-368-2100.

For news releases on the web, visit dnr.mo.gov/news.

For a complete listing of the department's upcoming meetings, hearings and events, visit the department's online calendar at dnr.mo.gov/calendar/search.do.

Looking for a job in natural resources? Go to dnr.mo.gov/hr.

Top Spots for

First Day Hikes

MoDNR photo by Kerry Hays



Christina Jaco photo



(Top left) A state park volunteer leads a First Day Hike at Roaring River State Park on New Year's Day, 2014.

(Left) Lake Wappapello State Park Manager Vergial Harp discusses flora and fauna with young hikers during a First Day Hike in 2016.

(Above) Visitors to Rock Bridge Memorial State Park walk the Grassland Trail on a bird-watching hike on Jan. 1, 2015. MoDNR photo by Ben Nickelson

Free, guided hikes in state parks and historic sites throughout the state will be held on Jan. 1. The annual effort is a part of America's State Parks First Day Hikes, which gives visitors the opportunity to start the year off right with an outdoor hike.

Guided hikes being hosted in state parks range from one-half mile to four miles and are taking place on a wide variety of trails in every region of the state. Here are a few parks to consider visiting on Jan. 1.

At Lake Wappapello State Park in Williamsville, a hike on Jan. 1 means opportunities for winter birding. The abundance of waterfowl that may be seen along Asher Creek and in the nearby cove has led to the area's designation as a winter waterfowl refuge. Hikers should watch for wintering birds such as eagles, ospreys and a number of duck species.

Roaring River State Park in Cassville is well known for trout fishing, but the rugged landscape also provides a scenic

backdrop to adventures. With few leaves on the trees, hikers can enjoy more open views of the hilled terrain and the opportunity to see a variety of wildlife. Bald eagles frequently are spotted within the park during the winter months.

Located near Columbia, Rock Bridge Memorial State Park typically holds several hikes throughout the day on Jan. 1. This gives guests a chance to traverse through some of Missouri's finest examples of karst topography, restored grasslands, forests and streams. Throughout the park's trails, hikers can find sinkholes, caves, underground streams and small springs.

For additional details on all of the First Day Hike events in state parks, visit mostateparks.com.





Osage Trail

at Clark's Hill/Norton State Historic Site

Walk in the footsteps of the Lewis and Clark Expedition on the Osage Trail at Clark's Hill/Norton State Historic Site. Between June 1 and June 3, 1804, the explorers camped at the base of Clark's Hill on their epic journey. William Clark climbed the hill on June 2 and saw a sweeping vista that included the confluence of the Missouri and Osage rivers.

Today, Osage Trail offers views of both the Osage and Missouri rivers. In 1804, the confluence of these two rivers was just beyond the overlook. Today, due to channelization of the Missouri River, these two rivers meet about seven miles away.

The trail is one half-mile, each way. On the way up the hill, which includes some very steep sections, visitors will pass two Indian mounds that Clark wrote about in his journal. Several interpretive panels along the trail discuss the Lewis and Clark Expedition. There are two benches along the trail and one at the overlook to provide a place to rest.

Clark's Hill/Norton State Historic Site is located in Cole County, just northeast of Osage City. For more information, visit mostateparks.com.

(Inset) Visitors can hike a wooded trail to the top of Clark's Hill and see the rock where William Clark stood to view the confluence of the Missouri and Osage rivers.

Much of the trail hugs the Missouri River, with breaks in the trees that offer expansive views of the river valley.

MoDNR photos by Ben Nickelson

Focus on Fossils

trilobite

Trilobites comprise an extinct class of marine arthropods that lived throughout the world's oceans during the Paleozoic Era between 540 and 250 million years ago. They are one of the signature creatures of that era.

The name "trilobite" alludes to the three-lobed construction of their bodies, with a central (axial) lobe flanked by two side (pleural) lobes. Their bodies consisted of a head (cephalon) with two compound eyes similar to present-day insects, a body (thorax) and a tail (pygidium).

Trilobites had chitinous exoskeletons, similar to modern-day arthropods such as crabs and lobsters. Their heads and tails were stiff, whereas their thoraxes were segmented, allowing them to arch their backs and bend forward completely. Trilobites had two rows of jointed legs underneath their bodies and two antennae protruding frontward from the undersides of their heads, although antennae rarely are preserved in fossils. Body size typically measured 1 to 2 inches, but ranged from nearly microscopic to about two feet long.

Most trilobites simply crawled around on the seafloor; some may have been swimmers. Others, especially the very small



This specimen preserves a 1.4-cm-wide trilobite trackway. It appears to be two side-by-side tracks, but is from a single trilobite.

Missouri Geological Survey photos



Breviphilipsia sampsoni is considered a rare trilobite species. It is found in Mississippian-age (roughly 358.9 to 323.2 million years ago) limestone rock strata, typically in Saline County, Mo. The specimen pictured is 1.7 cm long and was found near the city of Gilliam, in the 1980s.

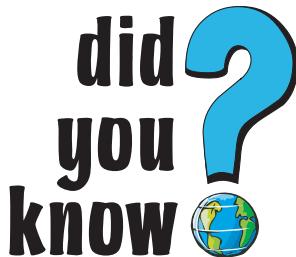
ones, may have been planktonic and drifted along with the ocean currents.

When disturbed or threatened, a trilobite could protect its thin-skinned and vulnerable underside by bending its body so the bottom of its head closed snuggly against the bottom of its tail, similar to the way a pill bug rolls itself into a ball.

The feeding habits of trilobites are thought to have ranged from eating organic detritus to scavenging dead organisms to predation. As the old saying goes, "big ones likely ate little ones." In order to grow, trilobites had to shed their exoskeletons periodically.

Trilobites belong to the Kingdom: Animalia, Phylum: Arthropoda ("Arthropoda" means "joint-footed" and includes Crustaceans, Insects, Centipedes, Millipedes, Spiders, Scorpions, Trilobites, etc.), and Class: Trilobita ("Trilobite" means "three-lobed"). More than 20,000 different species representing about 5,000 genera of trilobites are known to have existed.

Visit the department's Ed Clark Museum of Missouri Geology and see trilobites and other fossils. Learn more online at dnr.mo.gov/geology/edclarkmuseum.htm.



Liquefaction Documented During Earthquakes in Southeast Missouri's Bootheel

Liquefaction is a process that occurs when what appears to be solid ground loses its shear strength and begins to behave like a liquid. This most often is observed when a sudden

shock or shaking, like that of an earthquake, changes the conditions and adds stress to the soil.

Liquefaction can cause sandblows, fissures, lateral spreading and subsidence of the land surface. Buildings can sink or tilt, and air-filled void spaces such as buried tanks and sewer lines can rise to the surface as the soil liquefies. Liquefaction also can cause significant damage to roads, levees and public utilities.

In Missouri, liquefaction has been documented in the Bootheel, located in southeast Missouri, from the 1811–1812 New Madrid Earthquakes and from earthquakes dating back to 1400 and 900 A.D. The Bootheel and Mississippi River

valley are vulnerable to liquefaction because of loose sandy soils, shallow groundwater, and relatively high probability of moderate to large earthquakes.

The Missouri Geological Survey developed geologic hazards maps to help determine the risk of liquefaction in the event an earthquake occurs in the New Madrid Seismic Zone. These maps are available from the Missouri Geology Store by calling 573-368-2100. Learn more about earthquakes online at dnr.mo.gov/geology/geosrv/geores/techbulletin1.htm.



... but not least

MISSOURIANS APPROVE PARKS, SOILS AND WATER SALES TAX

by Andrea Balkenbush

Missouri voters renewed the Parks, Soils and Water Sales Tax for the fourth time in 2016.

The renewal of the sales tax was supported by an unprecedented 80 percent and passed by a majority vote in every county of the state. The continued support of citizens ensures that Missouri will remain a national model for the award-winning state parks system and soil and water conservation efforts in Missouri.

The approval highlights that four out of five voters support the work of the Soil and Water Conservation Program and Missouri State Parks. Every county in the state receives benefits from the sales tax funds, and it is supported by many diverse partners across the state. The benefits of the sales tax are supported by agricultural partners, landowners, outdoor enthusiasts and conservationists, as well as the many Missouri citizens that enjoy and appreciate the benefits achieved through these efforts.

In 2015 alone, state parks attracted over 19 million visitors who contributed to Missouri's economy – many of whom were outside visitors to the state and brought in additional revenue.

"The renewal of this key funding source is a reflection of the hard work that staff in the Soil and Water Conservation Program and Missouri State Parks do on behalf of Missourians," said Harry Bozoian, director of the Missouri Department of Natural Resources. "It shows that Missourians care about the fields we farm, the water we drink, and the natural and cultural beauty that is preserved. I thank all of the members of the public and the Citizens Committee for their work to ensure that Missouri's legacy of outstanding state parks, healthy waters and soil conservation continues for future generations."

The Parks, Soils and Water Sales Tax is placed on the ballot every 10 years to reaffirm the voters' support of the park system and soil and water conservation efforts.

Andrea Balkenbush is chief of the Outreach & Education Program for the Missouri Department of Natural Resources and provided coordination for the parks, soils and water efforts.



(Top) A farmer clears a road with his tractor after a heavy snow.

photo by Beverly Lancaster, New Franklin

(Above) Visitors to Castlewood State Park enjoy a brisk hike on a wintry day.

MoDNR photo by Tom Uhlenbrock

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The Cast of Thousands

Experience a Missouri tradition – opening day of the catch-and-keep trout season.

The season kicks off March 1 at 6:30 a.m. at Bennett Spring State Park near Lebanon, Montauk State Park near Salem, and Roaring River State Park near Cassville. In addition to premier trout fishing, visitors can enjoy miles of hiking trails, lodging and camping options and on-site dining facilities.

Plan your visit
[at mostateparks.com.](http://mostateparks.com)



*Missouri State Parks – a division of the
Missouri Department of Natural Resources*